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# **Maintaining the Database for Information Object Analysis, Intent, Dissemination and Enhancement (IOAIDE) and the US Army Research Laboratory Campus Sensor Network (ARL CSN)**

**by Laurel C Sadler**

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# **Maintaining the Database for Information Object Analysis, Intent, Dissemination and Enhancement (IOAIDE) and the US Army Research Laboratory Campus Sensor Network (ARL CSN)**

**by Laurel C Sadler**

***Computational and Information Sciences Directorate, ARL***

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14. ABSTRACT The research database discussed in this report supports both Information Object Analysis, Intent, Dissemination and Enhancement (IOAIDE) and the US Army Research Laboratory (ARL) campus sensor network (CSN), allowing IOAIDE to use all data made available from the ARL campus sensors. This report describes, in intricate detail, the steps involved in maintaining the IOAIDE/ARL CSN database. It is targeted at developers and users with the basic knowledge and understanding of the Windows-based computer operations as well as basic knowledge of Microsoft Structured Query Language Server Management Studio (2014 or 2016).					
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## **1. Introduction**

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Information Object Analysis, Intent, Dissemination, and Enhancement (IOAIDE) is a novel information framework developed at the US Army Research Laboratory (ARL), which supports the needs of command and control analysts as well as researchers in both algorithm and tool prototyping. IOAIDE has the ability to support dynamic plugin of analysis modules for either research or analysis tasks. The framework integrates multiple image processing algorithms accessed from a representational state transfer (REST) web service; image and video feeds; a dissemination service for the dissemination and retrieval of information objects; and a central research database for storage and query of information objects.<sup>1</sup>

The ARL campus sensor network (CSN) provides an Army-relevant experimentation network onto which researchers and developers deploy state-of-the-art and internally developed sensors producing diverse types of data. The data produced by the various sensors are disseminated to and stored in the central research database that is accessed by IOAIDE.

The research database discussed in this report supports both IOAIDE and the ARL CSN, allowing IOAIDE to use all data made available from the ARL campus sensors. This report describes, in intricate detail, the steps involved in maintaining the IOAIDE/ARL CSN database. It is targeted at developers and users with the basic knowledge and understanding of the Windows-based computer operations as well as basic knowledge of Microsoft Structured Query Language (SQL) Server Management Studio (2014 or 2016).

## **2. Computer and Software Development Tools Requirements**

---

The database supporting IOAIDE/ARL CSN was designed and is maintained with Microsoft SQL Server Management Studio. The basic requirements for the IOAIDE/ARL CSN database development and maintenance environment prior to executing the instructions in this report include having a Microsoft Windows device running Windows 8 or 10 and a Microsoft SQL server (2014 or 2016) installed. All images in this report were generated using Windows 10. The IOAIDE/ARL CSN database could reside on the user's computer, the demonstration computer, or a central computer. This report describes examples using the database on the demonstration computer. The server name for this computer is "Juliette", as shown in Fig. 1.

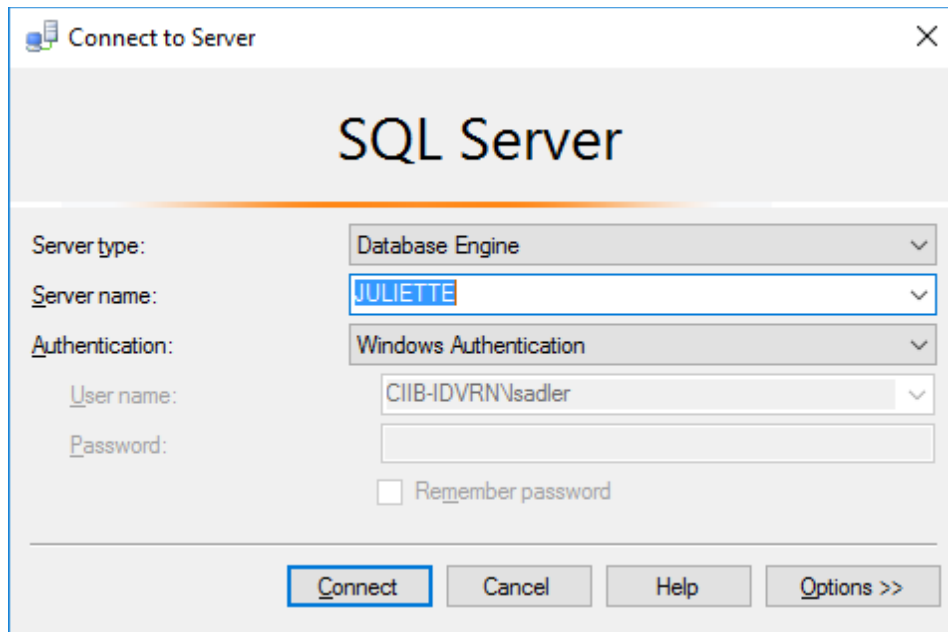


Fig. 1 Connect to Server window

### 3. Database Maintenance

This section explains all the steps necessary to delete data from various types of messages from multiple tables in the IOAIDE/ARL CSN database. It demonstrates how to delete the data from the database with and without the use of a provided SQL script.

The first 2 sections describe how to delete data from the Track table when it has not been linked to the DSPro and ibids tables, as it is when a report is received via the DSPro<sup>2</sup> dissemination service. Primarily, Track data from a video tracker will be submitted directly to the IOAIDE/ARL CSN database without the need for the DSPro dissemination service, which makes deleting the data simple.

The third and fourth sections describe how to delete DSPro messages that are received without further classification into other message types. These messages are linked to the ibids table, making the delete process more complicated.

The fifth and sixth sections describe how to delete data from a Check Point Report table, this includes Spot Reports since they are stored in the Check Point Report table. These messages are received via DSPro and are therefore linked to both the DSPro and ibids tables, further complicating the delete process.

The last section describes how to delete Cursor on Target<sup>3</sup> events, using a SQL script. These messages were received via the DSPro dissemination service and are


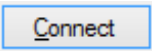








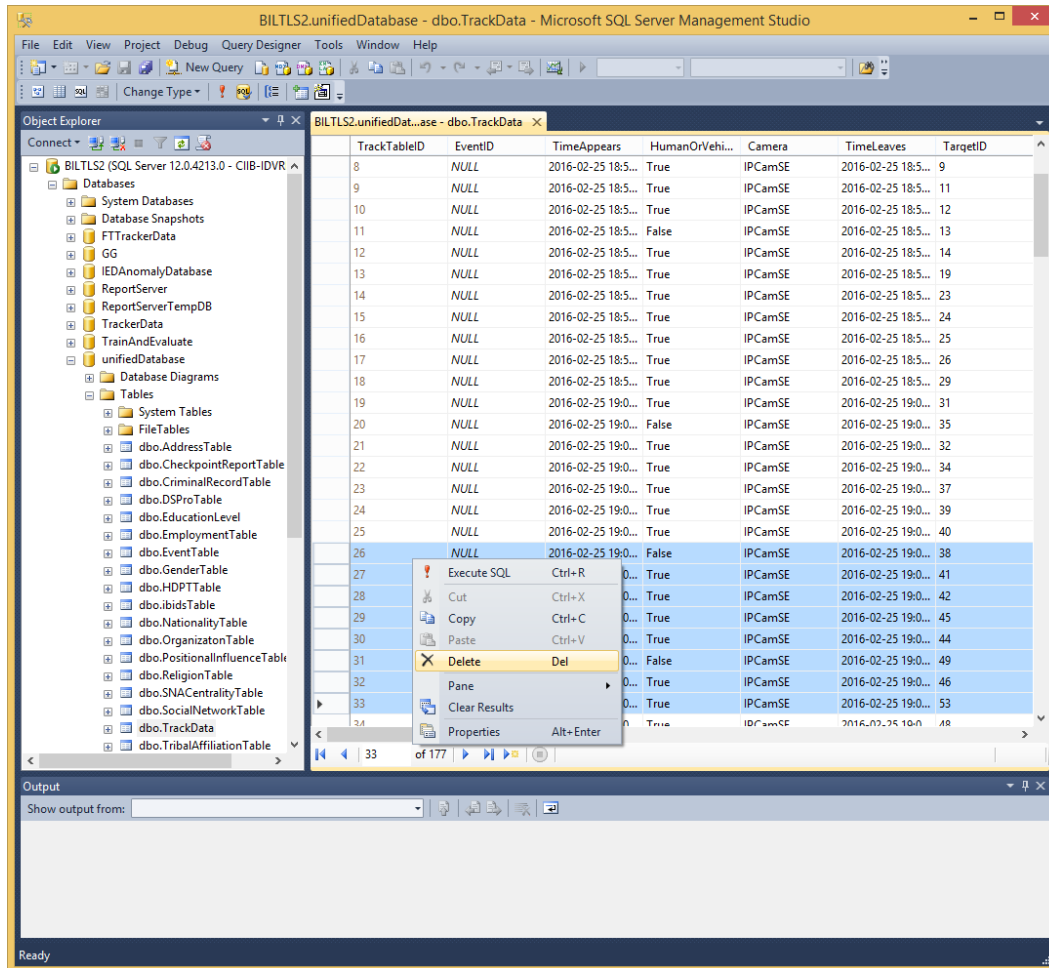
linked to both the DSPro and ibids tables. When deleting a large amount of data, I recommend using a SQL script for convenience.

### 3.1 Deleting Data from the Track Table Only

---

Perform the following to delete data from the Track table only:






- 1) Click the Windows icon  -> Microsoft SQL Server 2016->SQL Server Management Studio. The Connect to Server window will appear on the screen (Fig. 1).
- 2) Click .
- 3) Click + next to Databases   **Databases**.
- 4) Click + next to the unifiedDatabase   **unifiedDatabase**.
- 5) Click + next to Tables   **Tables**.
- 6) Edit the Track table. Right click TrackTable-> Edit Top 200 Rows. If the row(s) to be deleted are not in the top 200 rows, see the additional information in Section 3.8.
  - a) Select the item(s) to be deleted (shown in Fig. 2, highlighted in blue).
  - b) Right click the highlighted area and select Delete. The designated item(s) will be deleted from the table (Fig. 2).



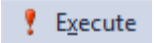
**Fig. 2 Deleting Track data**

### 3.2 Deleting Data from the Track Table Only Using the Provided Script

Perform the following to delete data from the Track table only using the provided script (use this option when deleting large amounts of data):

- 1) Click the Windows icon  ->Microsoft SQL Server 2016->SQL Server Management Studio. The Connect to Server window will appear on the screen (Fig. 1).
- 2) Click .
- 3) Click + next to Databases .
- 4) Click + next to the unifiedDatabase .
- 5) Click + next to Tables .

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- 6) To view the top 1,000 rows of the Track table, Right click TrackTable->Select Top 1000 Rows. If the row(s) to be deleted are not in the top 1,000 rows, see the additional information in Section 3.8 to view additional rows:
  - a) Determine the row(s) to be deleted. Note the corresponding TrackTableID value(s) for the row(s).
- 7) In the SQL Server Management window, navigate to File->Open->File....
- 8) The File Explorer window will appear. Navigate to C:\ARLDeveloper\Components\DatabaseScripts.
- 9) Select DeleteTrackData.sql.
- 10) Modify the file to indicate the row(s) to be deleted by changing the TrackTableID value(s) to include the row(s) specified for deletion using the ID value(s) found in step 6a (Fig. 3).
- 11) Click . This action executes the script and deletes the designated row(s). Using the example shown in Fig. 3, row(s) numbered 73–97 will be deleted upon execution of the script.

```

use unifiedDatabase
delete TrackData
where TrackTableID > 72 and TrackTableID < 98


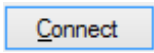


```



**Fig. 3 Example script to delete Track data**

### 3.3 Deleting Data from the DSPro Table Containing a DSPro Message Type Only

---

Perform the following steps to delete data from the DSPro table containing a DSPro message type only. These data are referenced by both the DSPro and ibids tables.


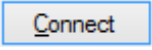







- 1) Click the Windows icon  ->Microsoft SQL Server 2016->SQL Server Management Studio. The Connect to Server window will appear on the screen (Fig. 1).
- 2) Click .
- 3) Click + next to Databases  **Databases**.
- 4) Click + next to the unifiedDatabase  **unifiedDatabase**.

- 5) Click + next to Tables   Tables .
- 6) Edit the DSPro table. Right click DSProTable-> Edit Top 200 Rows. If the row(s) to be deleted are not in the top 200 rows, see the additional information in Section 3.8 to view additional rows.
  - a) Determine the row(s) to be deleted. Note the ID value(s) of the row(s) to be deleted. The ID value(s) in the DSPro table correspond to the DSPro ID value(s) in the ibids table.
  - b) Leave the window open.
- 7) Edit the ibids table. Right click IbidsTable ->Edit Top 200 Rows. If the row(s) to be deleted are not in the top 200 rows, see the additional information in Section 3.8.
  - a) Set the value(s) of the DSProID to NULL for the row(s) in which the DSProID value(s) match the ID value(s) found in step 6a.
  - b) Note the corresponding ID value(s) of the effected row(s) in this table. The ID value(s) in the ibids table correspond to the ibidsTable value(s) in the DSPro table.
  - c) Leave the window open.
- 8) Return to the DSPro table edit window:
  - a) Select the row(s) in which the ID value(s) match the DSProID value(s) found in step 6a (Fig. 2).
  - b) Right click the highlighted area and select Delete. The designated row(s) will be deleted from the table (Fig. 2).
  - c) Return to the bidsTable edit window.
- 9) Select the row(s) in which the ID value(s) match to the ibidsTableID value(s) found in step 7b (Fig. 2).
- 10) Right click the highlighted area and select Delete. The designated row(s) will be deleted from the table (Fig. 2).

### **3.4 Deleting Data from DSPro Table Containing DSPro Message Type Only Using the Provided Script**

---

Perform the following to delete data from the DSPro table containing DSPro message types only using the provided script. These data are referenced by both the DSPro and ibids tables. (Use this option when deleting large amounts of data.)

- 1) Click the Windows icon  ->Microsoft SQL Server 2016->SQL Server Management Studio. Connect to Server window will appear on the screen (Fig. 1).
- 2) Click .
- 3) Click + next to Databases   **Databases**.
- 4) Click + next to the unifiedDatabase   **unifiedDatabase**.
- 5) Click + next to Tables   **Tables**.
- 6) To view the top 1,000 rows of the DSPro table, right click DSProTable->select Top 1000 Rows. If the row(s) to be deleted are not in the top 1,000 rows, see the additional information in Section 3.8 to view additional rows.
  - a) Determine the row(s) to be deleted and note the corresponding ibidsTable value(s). The ibidsTable value(s) in the DSPro table correspond to the ID value(s) of the row(s) in the ibids table. The value(s) are used in the following script.
- 7) In the SQL Server Management window, navigate to File->Open->File....
- 8) The File Explorer window will appear. Navigate to C:\ARLDeveloper\Components\DatabaseScripts.
- 9) Select DeleteibidsdsproOnescript.sql (Fig. 4).
- 10) Modify the script to indicate the row(s) to be deleted by changing the ID and ibidsTable value(s) to include the value(s) of the ID value(s) found in step 6a (Fig. 4).
- 11) Click . This action will execute the script and delete the designated row(s). Using the example shown in (Fig. 4), row(s) numbered 62–91 will be deleted upon execution of the script.

```

use unifiedDatabase

update ibidsTable
set DSProID = NULL
where id > 61 and id < 92

delete DSProTable
where ibidsTable > 61 and ibidsTable < 92


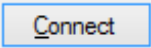






delete ibidsTable
where id > 61 and id < 92

```

**Fig. 4** Example of a SQL script to delete DSPro type messages

### 3.5 Deleting Data from the Check Point Report Table

Perform the following to delete data from the Check Point Report table:


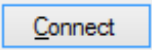






- 1) Click the Windows icon  ->Microsoft SQL Server 2016->SQL Server Management Studio. The Connect to Server window will appear on the screen (Fig. 1).
- 2) Click .
- 3) Click + next to Databases   **Databases**.
- 4) Click + next to the unifiedDatabase   **unifiedDatabase**.
- 5) Click + next to Tables   **Tables**.
- 6) Edit the Check Point Report table. Right click CheckpointReportTable ->Edit Top 200 Rows. If the row(s) to be deleted are not in the top 200 rows, see the additional information in Section 3.8.
  - a) Identify the row(s) to be deleted and note the corresponding DSProTableId value(s) and the ID value(s). The ID value(s) in the Check Point Report table correspond to the CheckpointReportTable value(s) in the DSPro table.
  - b) Leave the window open.
- 7) Edit the ibids table. Right click IbidsTable ->Edit Top 200 Rows. If the row(s) to be deleted are not in the top 200 rows, see the additional information in Section 3.8.

- a) Set the value(s) of DSProID to NULL for the row(s) in which the DSProID value(s) match the DSProTableId value(s) found in step 6a.
  - b) Note the corresponding ID value(s) of the row(s) in step 7a. These value(s) correspond to the ibidsTable value(s) in the DSPro table.
  - c) Leave the window open.
- 8) Edit the DSPro table. Right click DSProTable->Edit Top 200 Rows. If the row(s) to be deleted are not in the top 200 rows, see the additional information in Section 3.8.
- a) Set the value(s) of the Check Point Report table to NULL for the row(s) in which the value(s) of the CheckpointReportTable value(s) match the ID value(s) found in step 6a.
- 9) Return to the Check Point Report table edit window.
- a) Select the row(s) with the ID value(s) that match the ID value(s) found in step 6a (Fig. 2).
  - b) Right click the highlighted area and select Delete. The designated row(s) will be deleted from the table (Fig. 2).
- 10) Return to the DSPro table edit window
- a) Select the row(s) in which the ID value(s) match the DSProID value(s) found in step 7a (Fig. 2).
  - b) Right click the highlighted area and select Delete. The designated row(s) will be deleted from the table (Fig. 2).
- 11) Return to the ibids table edit window
- a) Select the row(s) in which the ID value(s) match to the ibidsTableId value(s) found in step 7 (Fig. 2).
  - b) Right click the highlighted area and select Delete. The designated row(s) will be deleted from the table (Fig. 2).

### 3.6 Deleting Data from Check Point Report Table and Corresponding DSPro and Ibids Tables Using the Provided Script

---

Perform the following to delete data from the Check Point Report table and corresponding DSPro and ibids tables using the provided script. (Use this option when deleting large amounts of data.) This includes Check Point Reports and Spot Reports, which are both stored in the Check Point Report table.

- 1) Click the Windows icon  ->Microsoft SQL Server 2016->SQL Server Management Studio. The Connect to Server window will appear on the screen (Fig. 1).
- 2) Click .
- 3) Click + next to Databases   **Databases**.
- 4) Click + next to the unifiedDatabase   **unifiedDatabase**.
- 5) Click + next to Tables   **Tables**.
- 6) To view top 1,000 rows of the Check Point Report table, right click CheckPointReportTable->Select Top 1000 Rows. If the row(s) to be deleted are not in the top 1,000 rows, see the additional information in Section 3.8.
  - a) Determine the row(s) to be deleted and note the corresponding DSProTableId and ID value(s). The ID value(s) correspond to the value(s) for the Check Point Report table in the DSPro table.
- 7) To view the top 1,000 rows of the ibids table, right Click ibidsTable->Select Top 1000 row(s). If the row(s) to be deleted are not in the top 1,000 rows, see the additional information in Section 3.8.
  - a) Note the ID value(s) of the row(s) in which the DSProID value(s) match the DSProTableId value(s) found in step 6a.
- 8) In the SQL Server Management window, navigate to File->Open->File....
- 9) The File Explorer window will appear. Navigate to C:\ARLDeveloper\Components\DatabaseScripts.
- 10) Select DeleteCheckPointReportsibidsdsproOnescript.sql.
- 11) Modify the script to indicate the row(s) to be deleted (Fig. 5):



- a) Modify the first 4 actions of the script by changing the ID value(s), of CheckpointReportTable and DSProTableId to include the value(s) of the DSProTableId row(s) to be deleted found in step 6a.
- b) Modify the last action of the script by changing the ID value(s) to include the ibidsID value(s) identified in step 7a.
- c) Notice that the value(s) used in steps 11a and 11b are not necessarily the same.

```

use unifiedDatabase

update ibidsTable
set DSProID = NULL
where DSProID > 61 and DSProID < 64

update DSProTable
set CheckpointReportTable = NULL
where id > 61 and id < 64

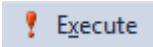
delete CheckpointReportTable
where DSProTableId > 61 and DSProTableId < 64

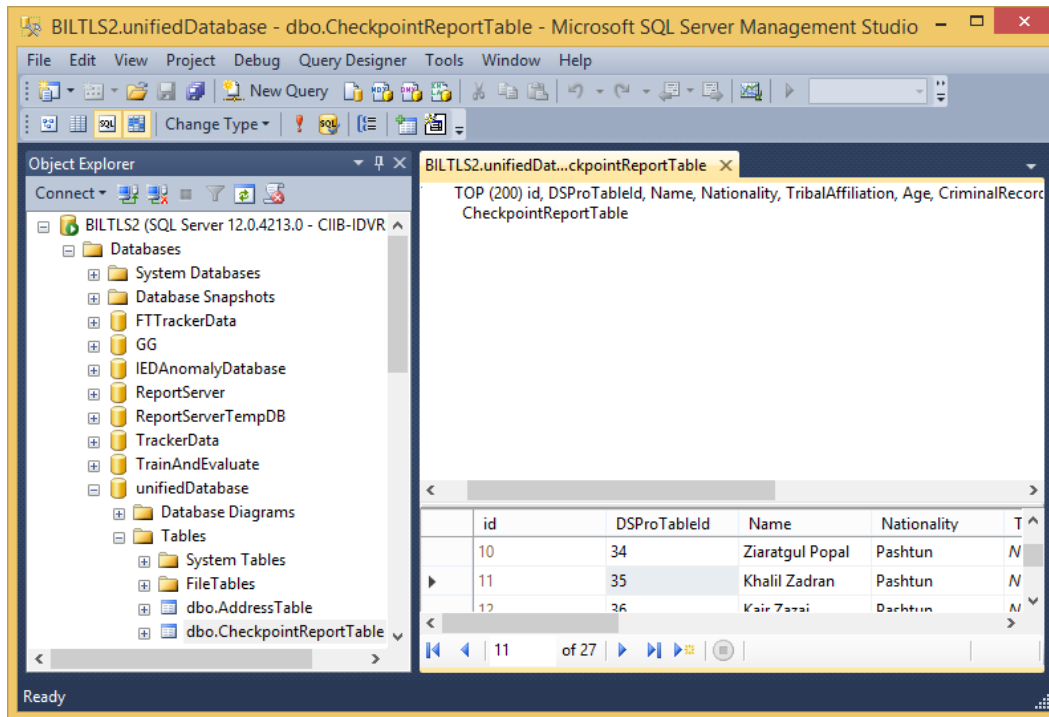
delete DSProTable
where id > 61 and id < 64

delete ibidsTable
where id > 67 and id < 70

```

**Fig. 5** Example script to delete Check Point Reports and corresponding tables


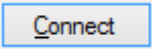



- 12) Click . This action will execute the script and delete the designated row(s) (Fig. 6). Using the example shown in Fig. 6, the DSProTable rows with ID values 94–100, ibidsTable rows with ID values 99–106, and the corresponding Check Point Report table rows will be deleted upon execution of the script.

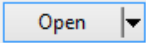
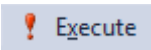


**Fig. 6 Edit SQL command**

### 3.7 Deleting Data from Event Table and Corresponding DSPro and Ibids Tables Using the Provided Script

Perform the following to delete data from the Event table and corresponding DSPro and ibids tables using the provided script (use this option when deleting large amounts of data):

- 1) Click the Windows icon  ->Microsoft SQL Server 2016->SQL Server Management Studio. Connect to Server window will appear on the screen (Fig. 1).
- 2) Click .
- 3) Click + next to Databases .
- 4) Click + next to the unifiedDatabase .
- 5) Click + next to Tables .
- 6) To view the top 1,000 rows of the Event table, right click EventTable->Select Top 1000 Rows. If the row(s) to be deleted are not in the top 1,000 rows, see the additional information in Section 3.8.

- a) Determine the row(s) to be deleted and note the ibidsLinkID value(s).
- 7) In the SQL Server Management window, navigate to File->Open->File....
  - a) The File Explorer window will appear. Navigate to C:\ARLDeveloper\Components\DatabaseScripts.
- 8) Select DeleteEventsibidsdsproOnescript.sql and click .
- 9) Modify the script to delete the appropriate rows (Fig. 7):
  - a) In all 5 actions, change the value(s) of ID and ibidsLinkID such that they correspond to the row(s) designated for deletion. Use the value(s) for IbidsLinkID found in step 6a.
- 10) Click  (Fig. 6). The designated row(s) will be deleted from the unifiedDatabase. The example shown in (Fig. 7) will delete Event rows, the events' corresponding DSPro table rows, and the corresponding ibids table rows from the database where the ibidsID values are between 61 and 92.

```
use unifiedDatabase

update ibidsTable
set EventID = NULL
where id > 61 and id < 92

delete EventTable
where ibidsLinkID > 61 and ibidsLinkID < 92

update ibidsTable
set DSProID = NULL
where id > 61 and id < 92

delete DSProTable
where ibidsTable > 61 and ibidsTable < 92

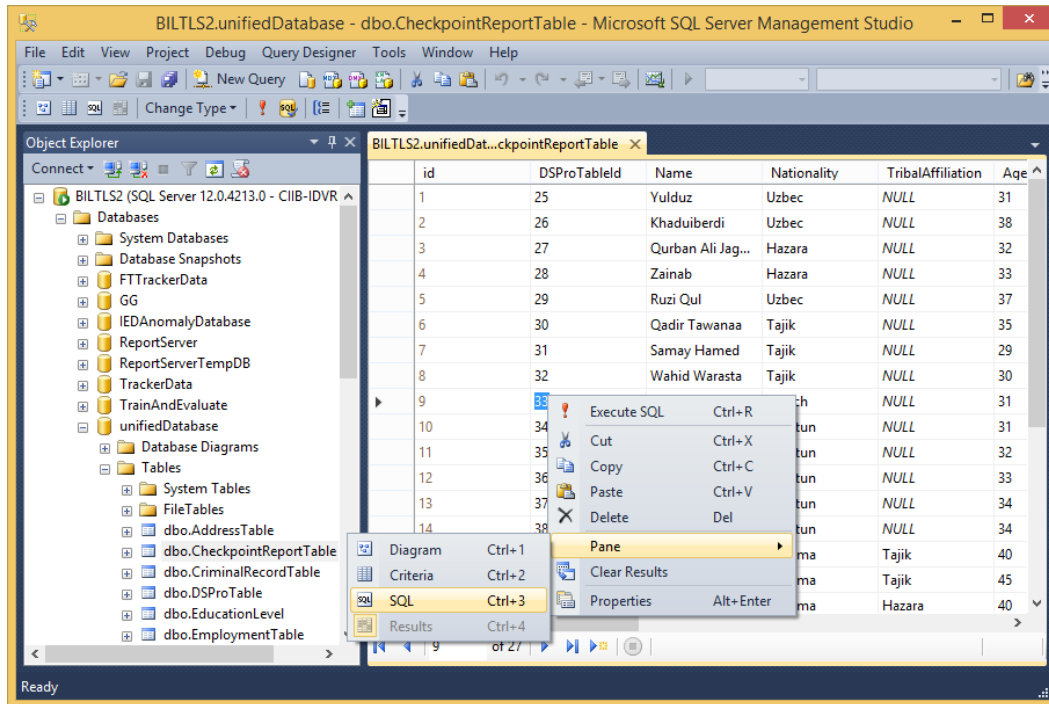
delete ibidsTable
where id > 61 and id < 92
```

**Fig. 7 Delete events from the database script**


### 3.8 Additional Information

If more than the top 200 rows need to be edited, perform the following:

- 1) Right click the database table and navigate to Edit Top 200 Rows and click as stated previously (step 10 in Section 3.7.)
- 2) Right click in the Edit window.
- 3) Navigate to Pane->SQL and click (Fig. 8).



**Fig. 8** Acquiring SQL command

- 1) Edit the SQL command in the upper window (Fig. 6):
  - a) Delete the top (200) in the Select portion of the script.
- 2) Click  **Execute** on the menu to execute this new command. All rows in this table can now be edited (Fig. 6).

## 4. Conclusion

The IOAIDE framework application is still under development. It is designed to be extensible, allowing for the addition of new enhancement applications and algorithms to the existing modules as they become available. It will accommodate new research areas by adding additional modules. In addition, the database supports

the ARL CSN onto which researchers and developers will continue to deploy state-of-the-art sensors with diverse types of data. In support these new developments, this “research” database will adapt to accommodate the additional data and necessary new data structures. This report describes all the steps required to maintain the IOAIDE/ARL CSN database in its current state.

This report will need to be updated as new research data formats are added to the database. The scripts illustrated in this report are SQL scripts and are attached to the PDF as .sql files.

## 5. References

---

1. Sadler LC, Michaelis JR. An information management framework for C2 data analysis in tactical operations centers. Proceedings of the 21st International Command and Control Research and Technology Symposium; 2016 Sep 6–8; London, UK.
2. DSPro overview. San Francisco (CA): GitHub; 2016 May 26 [accessed 2016 Dec]. <https://github.com/ihmc/nomads/wiki/DSPro-Overview>.
3. Butler, M. The developer's guide to cursor on target. Bedford (MA): The MITRE Corporation; 2005 Aug.

## List of Symbols, Abbreviations, and Acronyms

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ARL	US Army Research Laboratory
CSN	campus sensor network
ID	identification
IOAIDE	Information Object Analysis, Intent, Dissemination, and Enhancement
REST	representational state transfer
SQL	Structured Query Language

1 DEFENSE TECHNICAL  
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